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# Social Networks in Residential Environments: the Theoretical Concept and its Visualization using NodeXL

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## **Abstract**

Social networks can be said to have a supportive role not only in the digital world, but also by the creation of a social mix at a local level in the real world. This supportive role seems to be important in particular for socially disadvantaged persons, becoming apparent in the creating and maintaining of social contacts at the place they live. Illustrating these social relationships spatially is both the aim and the task of visualization, with new opportunities presenting themselves for everyone in this field as a result of free software such as NodeXL being developed and made available.

The case study outlined here – “Ackermannbogen”, a district of the Bavarian capital of Munich which has an urban character – deals with the issue of social networks and their visualization using NodeXL. One thing which becomes apparent on the basis of the analysis and visualization of social networks is that noticeable differences can be seen in the range they have. These differences are related to the location of the place of residence. Men and women living in the central location of the Ackermannbogen have social networks with a greater supportive function to people living in the same construction phase. In contrast to this finding social networks with a lower supportive function primarily origin from buildings located in the southern location of the Ackermannbogen. These social networks of socially disadvantaged population groups remain for the majority of the people asked in the same apartment block or the same street.

*Visualization; social networks; NodeXL; supportive function; Munich; Ackermannbogen*

## **Zusammenfassung**

### **Soziale Netzwerke in der Wohnumgebung: Von deren theoretischem Konzept und deren Visualisierung mittels NodeXL**

Soziale Netzwerke – ihnen kann nicht nur in der digitalen Welt, sondern auch durch die Umsetzung der sozialen Mischung auf lokaler Ebene in der realen Welt eine unterstützende Rolle zugesprochen werden, die vor allem für sozial benachteiligte Personen von Bedeutung erscheint und sich durch die Generierung und den Erhalt sozialer Kontakte am Wohnort erschließt. Jene sozialen Beziehungen im Raum zu veranschaulichen ist zugleich Ziel und Aufgabe der Visualisierung, wobei sich in diesem Bereich insbesondere durch die Entwicklung und Bereitstellung kostenloser Software wie NodeXL neue Möglichkeiten für Jedermann erschließen.

Das in dieser Studie skizzierte Fallbeispiel des Ackermannbogens, eines städtisch geprägten Quartiers der Landeshauptstadt München, greift das Thema der sozialen Netzwerke und deren Visualisierung mittels NodeXL auf, wobei sich anhand der durchgeführten sozialen Netzwerkanalyse und -visualisierung zeigt, dass sich merkbare Unterschiede in deren Reichweite ausmachen lassen. Jene stehen dabei in Verbindung mit der Lage des Wohnortes. Männer und Frauen, die in zentraler Wohnlage des Ackermannbogens leben, haben soziale Netzwerke mit einer größeren Unterstützungsfunktion zu Personen, die im selben Bauabschnitt leben. Im Gegensatz zu diesem Ergebnis haben soziale Netzwerke mit einer geringeren Unterstützungsfunktion ihren Ursprung zumeist in der südlichen Wohnlage des Ackermannbogens. Diese sozialen Netzwerke sozial benachteiligter Bevölkerungsgruppen verbleiben für die Mehrheit der Befragten in ihrer Reichweite im selben Baublock oder derselben Straße wie die befragte Person.

*Visualisierung; soziale Netzwerke; NodeXL; Unterstützungsfunktion; München Ackermannbogen*

## Introduction

The subject of social networks has become increasingly important in the real world, particularly in the creation of social mixes, as it is based on the assumption that the physical proximity of a variety of socio-economic groups<sup>8</sup> in the housing market will make possible an extension of local social networks. Such an extension would appear to be significant for socially disadvantaged persons in particular, with the act of extending their social networks to persons from the middle class resulting in them benefiting from the higher level of supportive function which these offer (see TEXIER-AST 2017, p. 269ff.). Parallel to this development, and due to the rapid spread of the internet, numerous possibilities for the visualization of social networks have opened up, according to FREEMAN (2000, n.p.), and as a result social processes can be linked to their spatial extent. While a social network sounds promising because of the potentially supportive function attributed to it, and its visualization increases in importance through further technical developments, the following question nevertheless arises: Are social networks formed as a result of the social mix created in that residential area – networks which can support socially disadvantaged sections of the local population – and how can they be visualized to provide a clear illustration of them?

This article combines two subjects – research into social networks and the possibilities of visualizing them – by presenting a current case study relating to research into social networks in an inner-city area and visualizing it using NodeXL. The article is structured as follows: the introductory chapter ‘Theoretical foundations’ focuses on presenting definitions of the central terms used in the article – ‘social network’ and ‘visualization’. Here, the conceivable supportive function of social networks will be discussed as well as the history and possibilities

of visualizing such networks in the digital age. The next chapter ‘The Ackermannbogen in Munich – the area of research’ forms a bridge between the theoretical foundations and the empirical part of the article, presenting the Ackermannbogen in Munich as a location for the analysis of social networks and their visualization. Hereinafter, there follows presentation of the two-stage methodology of this study. This methodology consists in gathering data on the social networks and, building on this, structuring them, which then leads to a presentation of the structure of the social networks – the visualization by means of drawing up sociograms – using the NodeXL computer software. The ‘Results’ chapter presents the central findings from this study of social networks. The last chapter ‘Conclusion’ combines the theoretical and empirical findings resulting from the social networks analysis and visualization, reflects on them and also points out further possible areas of research.

## Theoretical foundations

### Social networks

Over the past two decades, the term ‘social network’ has become a central way of describing the social contacts that a person or an actor has with other persons or actors (see RÜRUP et al. 2015, p. 19; KILDUFF and TSAI 2003, p. 5). The connection between these persons or actors is defined as social relation (FUHSE 2016, p. 15). In research, as well as in academia, the term is used synonymously with various terms relating to social networks. Other synonyms which describe the concrete relationship that one person (Ego) has with another person (Alteri) in their social environment are the terms ‘informal’, ‘personal’, ‘private’ or ‘ego-centric’ networks, expressing the individualistic nature of such networks and their primary focus on the private sphere (DIEWALD 1991, p. 59)<sup>9</sup>. They can be deemed to play a significant role in the real world in the wake of planning and building activities associated

with the creation of a social mix at a local level. This can be explained as follows: as a result of the increasing tendency towards socio-economic division within towns and cities in western Europe, it is primarily disadvantaged areas in these that seem increasingly to be facing the danger of social exclusion at a steadily progressing rate (see HÄUSSERMANN 2001, p. 39; TEXIER-AST 2017, p. 268). In order to counteract this development, attention is being focused – both in urban redevelopment and in designing and building new residential areas – on providing buildings with a variety of structures regarding rents and owners at a local level. Such measures, according to VAN HAM et al. (2001, p. 1), are known as ‘area-based policies’. Meanwhile, the mixture of different forms of housing favours the creation of a physical proximity between different social groups in the population of a certain part of town. The resulting local co-existence of different socio-economic groups is discussed to be of particular benefit towards socially disadvantaged groups of people, as these – due to a lack of financial means – can be classified as more immobile in comparison with non-socially disadvantaged persons from the middle class, or even the upper, classes living in non-subsidized accommodation (see KRONAUER and VOGEL 2001, p. 45). It is not only this, however, which gives rise to a special social relationship with the residential environment for people living in social housing. Furthermore, due to the lack of role models of the middle class in socially disadvantaged neighbourhoods, the social behaviour of socially disadvantaged people deviates from the behaviour of people from the middle class, which makes them – in combination with the strong pressure of adapting to the deviating behaviour in the disadvantaged neighbourhood – even more dependent on internal people living in the neighbourhood (see HÄUSSERMANN 2001, p. 46f.). To sum up, the socio-economic status of a person does have an impact on the reach of social networks: disadvantaged groups of people are more dependent on social networks in the neighbourhood than people of the

<sup>8</sup> The terms ‘social and socio-economic sections of the population’ and ‘social and socio-economic mix’ are used synonymously in specialist discourse, as they are in this article.

<sup>9</sup> For the significance of whole networks, see FUHSE 2016, among others.

middle or upper class (see KRONAUER and VOGEL 2001, p. 45; see HÄUSSERMANN and SIEBEL 2004, p. 113; see HÄUSSERMANN 2001, p. 48).

The approach of implementing social mix on a local scale is being discussed as the base for the development of social networks between socially disadvantaged population groups and people from the middle class. Thereby the importance of social networks in the neighbourhood – especially for people living in social housing – is based essentially from its inherent resources, which can be exchanged reciprocally between one person (Ego) and another (Alteri) (see PETERMANN 2014, p. 64f.). These social networks function towards the production and distribution of social support according and can also be understood as ‘infrastructure’ to DIEWALD (1991, p. 59ff.).

In the context of this work the greater supportive function of people from the middle class is defined by the fact that people from this population group have e.g. more information at their disposal in the form of job vacancies in the formal sector. And, regarding subjective support, it can also be assumed that the socially disadvantaged population can gain in social competences through the mediation of cognitions and emotions from regular contacts with non-socially disadvantaged persons – they work as role models – in their residential surroundings. The former social deviating behaviour can modify towards a behaviour accepted by people of the middle class<sup>10</sup>. In this case people from the middle class can work as role models. In sum regular and mutual contacts from socially disadvantaged people to people of the middle class can contribute to the social integration of socially disadvantaged people to the middle class. The supportive function of social relations within social networks can on one hand be exchanged through regular and mutual contact between socially disadvantaged people and members of the middle class, resulting in the flow of information

on such vacancies improving for the socially disadvantaged. On the other hand, distinct importance can respectively be ascribed to the residential environment as a place for the potentially acquisition of social competences which can enable formerly socially disadvantaged segments of the population to physically extend their network in such a way that it can provide stronger social support. From the point of view of outsiders and of persons providing support, objective support means contributing to an improvement in the emotional and physical well-being of the person enjoying this support and being perceived and appraised by the person providing it (see DIEWALD 1991, p. 79).

Subjective support is experienced by the persons themselves receiving that support, and thus actively so. In the process, according to DIEWALD (1991, p. 79), this does not necessarily lead to any overlapping of the views that the supporters and the supported have.

It is the interactions between the individuals which are regarded as being the essential element which links the objective and the subjective supportive function of social networks. Simultaneously, as already indicated, these interactions are the premise for the supportive function exercised by the middle-class population living in the same neighbourhood as the socially disadvantaged population in the local area as a result of the regular contact between members of both groups. Consequently, simply living side by side does not lead to any supportive effect on the part of the middle class vis-à-vis the socially disadvantaged population in the area (see DIEWALD 1991, p. 77). Rather, as stated by PETERMANN (2014, p. 24), LIN (2001, p. 133f.) and BOURDIEU (1983, p. 193), only regular contacts in social networks can enable the resource of supportive function – greater on the part of the middle class – and thus can have a positive effect on the socially disadvantaged groups in the neighbourhood.

At this point critics of the social mix and the associated social networks between social disadvantaged people and persons of the middle class stress that people of a

higher social position do have a greater social supportive function but, according to LIN (2001, p. 57f.), it's necessary to keep in mind: ‘the closer or more similar the social positions, the more likely it is that the occupants will interact with another’. This aspect emphasizes the theoretical potential of social networks, but it also underlines the fact that they (social networks) do not develop per se through spatial closeness of different socio-economic population groups in a socially mixed neighbourhood, as well. And, in addition, GRANOVETTER points out in his book „Getting a job“ (ibid. 1995) that especially people of the middle class tend to disconnect from disadvantaged population groups. A tendency which limits the potentially supporting function of non-disadvantaged population groups on the latter.

### Visualization of social networks

It is above all a result of digitalization that the visualization of social networks has become increasingly important, although such visualization is by no means a development of modern times. Indeed, the first visualizations of social networks date back to the 13<sup>th</sup> century – a picture of a chessboard, drawn by hand, with the vertices showing possible positions and the edges showing the possible paths the figures can take between individual positions (see KRUIJA et al. 2001, p. 272). Further milestones in the continuing development of the visualization of social networks up until the present day can be seen, according to FREEMAN (2000, n.p.), in the ad-hoc drawings produced in the 1930s. Someone worthy of mention in this respect is the founder of sociometry and sociograms, J. L. MORENO, who presented different possibilities of depicting relationships between people (see PFEFFER 2010, p. 229). Around 20 years later, in the 1950s, came the first ‘use of standard computational procedures to produce images’ (FREEMAN 2000, n.p.; RÜRUP et al. 2015, p. 22). The opportunity to represent social networks digitally presented itself in the 1980s through the introduction of computers

<sup>10</sup> It must be mentioned, that social networks between socially disadvantaged people do also have a supportive function, but it can be classified as being lower in context of integration into the middle class.



in private homes. At the same time, as a result of further research for private persons, this was accompanied by further developments in ways of presenting social networks in colour, followed by the worldwide spread of the internet and 'all

sorts of new possibilities for graph display' which arose out of it from the early 1990s onwards (FREEMAN 2000, n.p.). Based on the knowledge that a graph (G) is a mathematical function of vertices (V) and edges (E) – thus ' $G=(V,E)$ ' – a visualization of social networks can be carried out for vertices and edges (FRUCHTERMANN and REINGOLD 1991, p. 1129). According to VIÉGAS and DONATH (2004, p. 6), this way of presenting social networks in sociograms is the more common method compared with that of using a 'matrix where rows and columns stand for people and the number in each cell stands for the social relation between the people' – i.e. sociometry.

The starting point for visualizing sociograms is the vertices, which, analogously to the edges and depending on the research being done and the visualization required, can be modified in theory regarding size, form and colour (see PFEFFER 2010, p. 228). As stated by KREMPEL (2005, p.157f.), the suitability of the form of visualization required in sociograms depends to a very large extent on the data pool being used as well as its measurement scale. Nominal node and edge attributes can be shown using derived colour codings. In contrast, as theorized by KREMPEL (2005, p. 157f.), ordinal attributes of a graph are represented by different colours in their ranking and metric

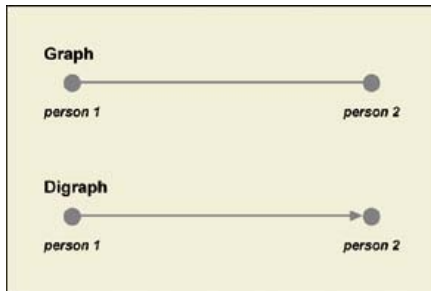


Figure 1: Graph and Digraph

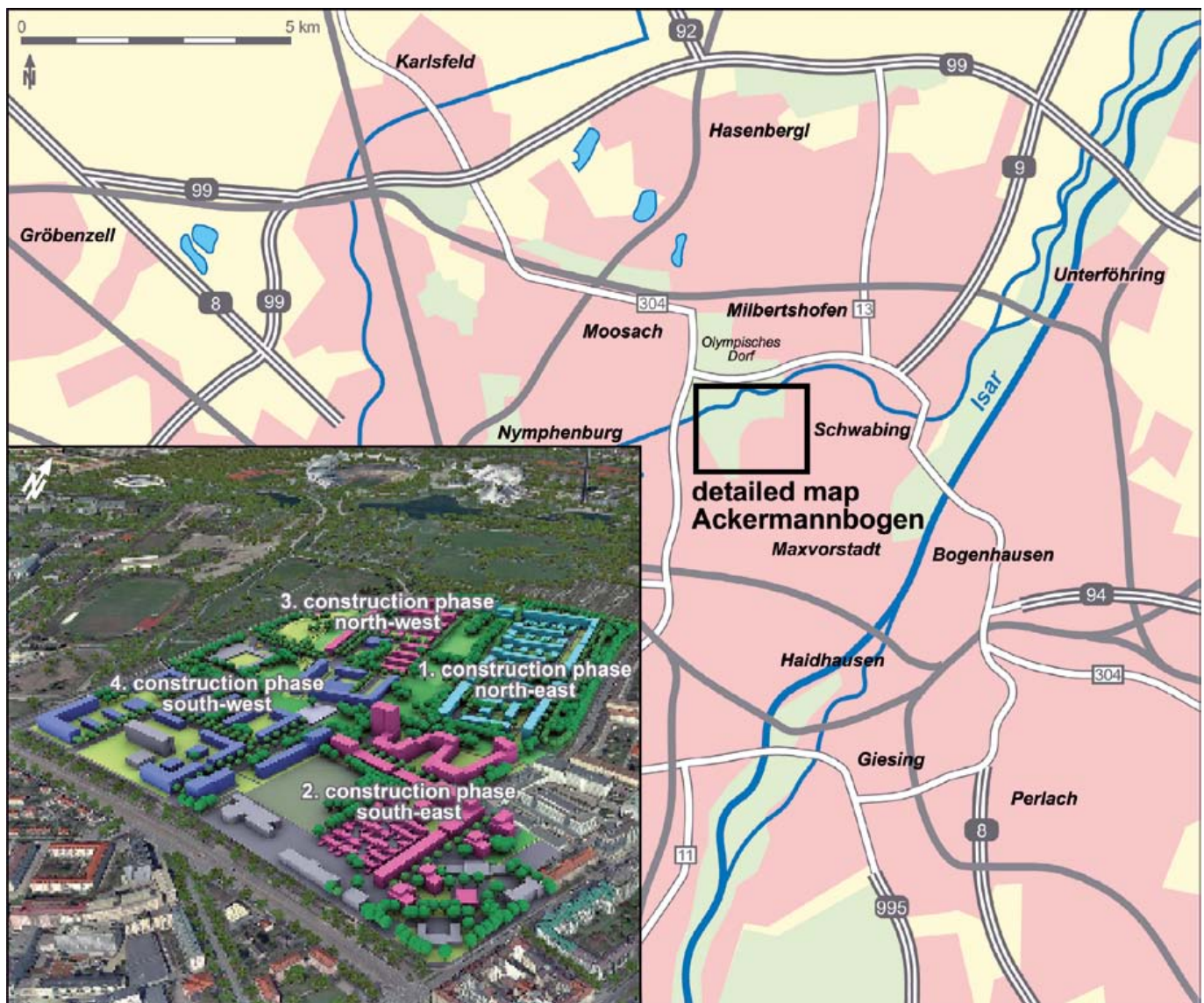


Figure 2: Spatial embedding of the Ackermannbogen and its four construction phases

Source: Landeshauptstadt München, 2015, n.p., own draft 2017, Texier-Ast 2017, p. 275, Cartographer: C. Schroer

attributes are shown ideally by a sequential colour scheme. Both vertices and edges which are to be assigned to the same attribute are shown in the same colour and with a similar colour saturation in order to underline where they belong. If the quantity of an attribute is the focus of the visualization, this can be made clear by modifying the size of the vertices and edges. Here too, however, the use of colours and colour gradations would appear to make sense, so long as they correspond to the quantitative information and underline its message. Directed and undirected graph types – also called graph and digraph respectively – can be used to make clear the connections between the nodes and a network (CHARTRAND, LESNICK and ZHANG 2011, p. 47)<sup>11</sup>. The former makes clear that the focus is on a relationship of equal value between, for example, person 1 and person 2 (see Figure 1). If the edge is visualized as a directed graph, this relationship between person 1 and person 2 can no longer be described as being symmetrical, but asymmetrical (see Figure 1) (see KREMPEL 2005, p. 80ff.).

Regarding the layout of the vertices and the resultant position of the edges, it should be borne in mind that there are two possibilities. For one, a layout can be used in line with the structure of the data pool – as in this study – whereby the visualization ties in with the structure of the social network and serves to show the results. An alternative option is to use the structure inherent in the data by using a variety of visualization algorithms<sup>12</sup> and to subsequently visualize the data following on from their computed relations. This approach is especially suitable for large quantities of data. In both cases, however, any visualization in 2D or 3D always presents a reduction of social networks and the layout should be individually modified, depending on the research interest (see PFEFFER 2010, p. 230).

### The Ackermannbogen in Munich – the area of research

The analysis and visualization of social networks by means of NodeXL is shown in this study using the example of the first construction phase of the Ackermannbogen in the north-west part of Munich, the capital of Bavaria (see Figure 2).

The Ackermannbogen contains 39.5 hectares in size and is located in the inner-city district Munich-Schwabing, adjacent to the Olympia Park (see Figure 2); (see LANDESHAUPTSTADT MÜNCHEN 2014, p. 2; LANDESHAUPTSTADT MÜNCHEN 2012, p. 1). This former new housing area has a very well developed technical and social infrastructure in all its four phases of construction. It can be considered to have a pioneering role not only in the field of ecological and sustainable housebuilding but also in regards to its architecture, which is visually attractive and multifaceted, displaying a looser style (see MAIER-SOLGK 2012, p. 48). The high quality of living conditions is reflected in the consistently high level of satisfaction among residents, with negligible turnover in the local population (see MAIER-SOLGK 2012, p. 48). As a result of the social mix the local population in the Ackermannbogen cannot be assigned to any particular socio-economic class. This mix is realized by having a fixed quota system for the entire area which is applied to every single construction phase. The quota system stipulates that in new housing areas such as the Ackermannbogen 30 % of the more than 2,200 apartments are to be built as social housing. This percentage means that an average income structure can be created amongst the residents – which ensures the preservation of the so-called ‘Munich mix’ and, at the same time, prevents too much social segregation (LANDESHAUPTSTADT MÜNCHEN 2006, p. 12; LANDESHAUPTSTADT MÜNCHEN 2014, p. 17ff.).

The first construction phase is the eldest of the four construction phases whereby social relations and its resulting social networks have already solidified.

Social housing buildings in this construction phase are located at the following three sites:

- in the north (north block: 66 flats)
- in the middle (central site: 28 flats) and
- in the south (south site: 32 flats).

Each of the blocks consists of two to five houses and comprises a total of 126 units of social housing<sup>13</sup> which are thus available to that segment of society which can be considered to be socio-economically disadvantaged and for which their own residential environment can be assumed to have a particular significance (see HÄUSSERMANN 2001, p. 48).

### Methodical approach

The methodical approach taken in this study can be divided into two successive steps (Step 1 and Step 2).

#### Step 1: Data collection and categorization

In the first step a survey of the residents living in social housing in the first construction phase of the Ackermannbogen was carried out between September 23<sup>rd</sup> and October 3<sup>rd</sup> of 2015. 125 households<sup>14</sup> were contacted in person; 64 % of them couldn't be reached after thrice attempting to establish contact during the survey period. Using a standardized questionnaire and a site map representatives of these households were asked the following key question: Do you have regular contacts at the Ackermannbogen? If the answer to this question was affirmative the questioned person was asked to relay the address or to draw an X in the map to indicate the location at the Ackermannbogen wherein each of the regular contacts resides<sup>15</sup>.

<sup>13</sup> This number is the difference between the 182 units of social housing and the 56 units with participatory character built by Wagnis eG, a housing cooperative. These 56 flats were excluded from this study as the cooperative of Wagnis eG is fostering social interactions of people living in this flats and this study deals with the potential of social mix in creating social networks initiated by living in the same neighbourhood (spatial proximity).

<sup>14</sup> The 126 units of social housing are reduced by 1 to 125 as one of the apartments was not occupied at the time of the survey.

<sup>15</sup> Contacts between the interviewees' contact persons were not registered. The mutual character of the regular contacts was affirmed during the standardized data collection by the people asked.

<sup>11</sup> For further information on graphs and digraphs, see CHARTRAND, LESNICK and ZHANG 2011.

<sup>12</sup> For an analysis of the structure of social networks and the possibilities of visualization to be derived from them, cf. for example Universität Köln n.d.; PFEFFER, J. 2010, p. 230; HENNIG et al. 2012, KREMPEL 2005, p. 89ff.



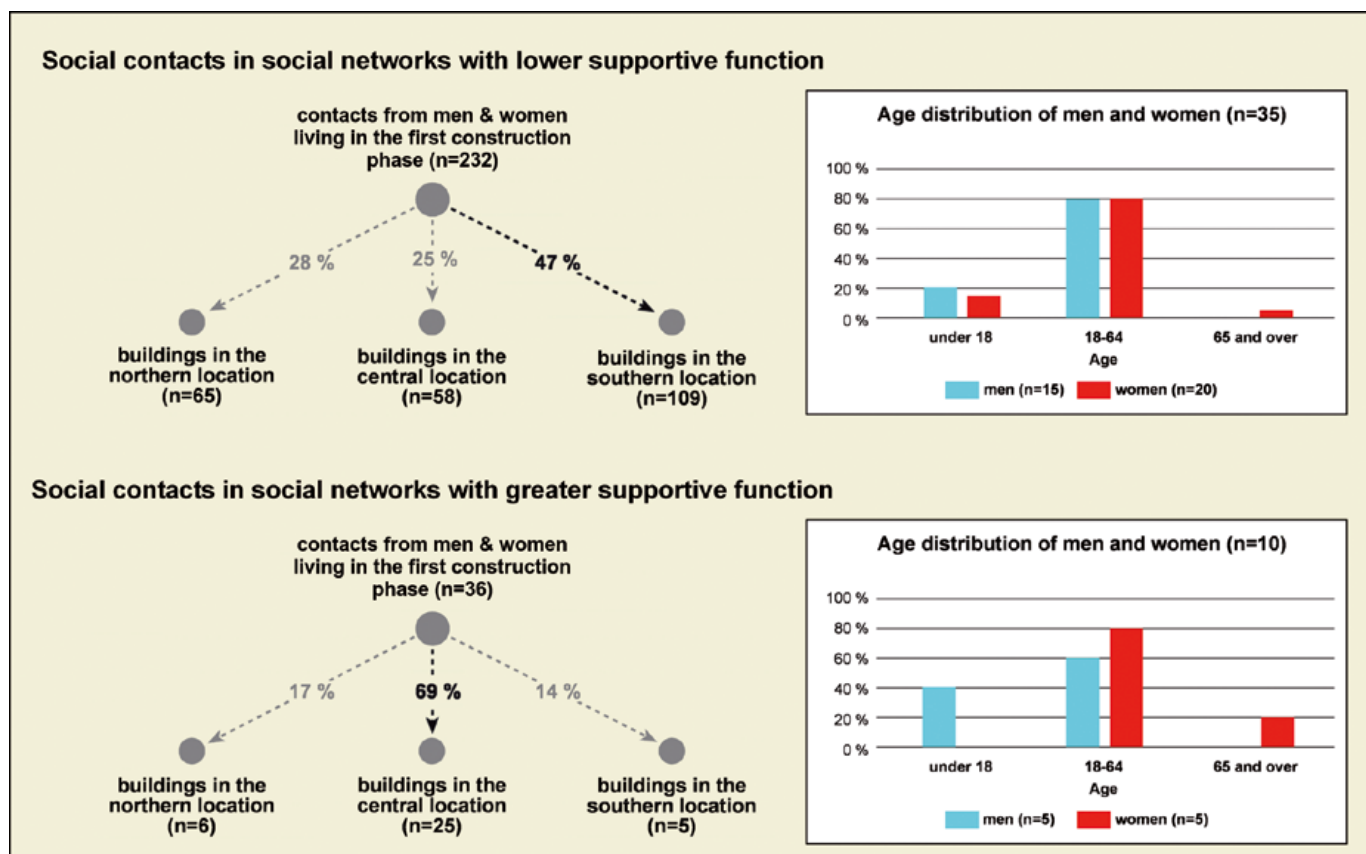


Figure 3: Social networks proceeding from the buildings sited in the north, the centre and the south within the first construction phase of the Ackermannbogen

Source: own computations, own figure 2017

Further details collected as part of the ego-centric network survey of the 45 people who had declared their willingness to take part in the standardized questionnaire included gender, age and current place of residence (see TEXIER-AST 2017, p. 278). In order to visualize the correlation of social networks and the location of the apartment in the first construction phase and also to determine unfavourable locations for the development of social networks with a potentially greater supporting function, the location of the domicile of the questioned people were assigned to the north block, the central site or the south site.

The age of those people questioned was assigned to one of three groups: 0–17 years old, 18–64 and people who are 65 years of age and older. In a subsequent step, the focus of categorization was moved away from the systematization of the data relating to the person questioned

and directed towards the contact person. As a result, the contact persons named in the Ackermannbogen were assigned to the following categories: living

- ‘in the same house’<sup>16</sup>,
- in the same street,
- in the same construction phase as the domicile of the person questioned, or living

- in a different construction phase’ as the interviewee (TEXIER-AST 2017, p. 280f.). In addition, and based on the knowledge of which houses are designated as social housing, the thusly located contact persons were divided into the following two categories: one being contact persons who, because they live in social housing, are designated as people with a lower supportive function; and the other

group being composed of people who, because they live in non-social housing, have a greater supportive function.

Overall, a basis was created which enabled a gender-specific and spatially differentiated visualization of social networks in the Ackermannbogen as it coincides with their greater or lower supportive function.

## Step 2: Visualization of social networks with NodeXL

As a ‘summary of the findings to which a careful analysis has led’, these networks were visualized on the basis of their components, the edges – represented by the domicile of the person questioned as well as that of the contact person in each case – by using the NodeXL software (HENNIG et al. 2012, p. 150). This free software is, as BONSIGNORE et al. (2009, p. 332) state, ‘easy to adopt for existing users of Excel (...)’, as it has just one further tab in the header within Excel and lends itself easily to ‘learning by doing’ (HANSEN et

<sup>16</sup> Contact persons from non-social housing cannot live in the same house as the people interviewed living in social housing because of the social mix implemented at house-entrance level. Therefore this category does not arise in the presentation of social networks with a greater supportive function.

al. 2011, p. 51). One fundamental point when using it is simply to know that two spreadsheets are important for visualizing the social networks in the spreadsheet. Firstly, the 'vertices' spreadsheet, which shows all the data relating to the vertices to be visualized and furthermore allows a variety of settings in the areas of visual properties, labels and layout. Secondly, individual adjustments can also be made on the 'edges' spreadsheet – via the options in 'visual properties' and 'labels' – depending on the aim of the research and on personal preferences.

Based on the categorization by domicile of the persons questioned – in one of the three sites mentioned above – and on their contact person(s) in the Ackermannbogen (subdivided into three of four categories), the vertices were entered in the 'vertices' spreadsheet. The edges were specified as links between the vertices by entering the vertices to be linked up in the 'edges' spreadsheet. In designing the layout of the social networks, attention was paid, as MORENO (1953, p. 141) suggests, to there being as little overlap between the lines as possible. Further adjustments were made to the layout in line with the aim of the assignment – to visualize the analysed social networks.

## Results

A total of 45 people agreed to take part in the standardized survey, with 35 of these having regular contacts in the Ackermannbogen (see TEXIER-AST 2017, p. 279). 10 of 35 people (22 %) noted to have regular contact to people of both types of supportive function: lower supportive function and greater supportive function, which have a ratio of 86:36 (see TEXIER-AST, 2017, p. 279). The subsequent social networks, comprised of these regular contacts and their respective relationships, were visualized using NodeXL and differentiated first by their supportive function, and then by their location. These visualized social networks were combined with diagrams<sup>17</sup> showing

the participants age group and gender. This led to the following results.

A total of 87 % of the 268 contacts registered were classified as social contacts with a lower supportive function as these contacts are with persons who, like the person questioned, live in social housing. In contrast, only 13 % of all contacts can be designated as contacts with a higher supportive function, as they are with persons who do not live in social housing in the Ackermannbogen (see *ibid.* 2017, p. 279).

49 % of the people asked live in buildings located in the north, further 26 % live in flats in the southern location and also 26 % in flats in the central location.

Concerning the size of the social networks it can be stated that the total average mean of social contacts – also called grand mean – with a higher supportive function is 3,2 per person; social networks consisting of 7,4 social contacts per person with a lower supportive function on average.

Regarding the spatial extent of the surveyed social networks of socially disadvantaged population groups – and therefore focusing on the group mean as coincides with each location of socially supported housing – it can be said that the average number of social contacts with a lower supportive function in social networks with 12 contacts per person is the highest for people living in the southern location of the Ackermannbogen. A result which runs contrary to the spatial extent of social networks with greater supportive function. The highest average number of contacts to people with a greater supportive function (5) can be found for people living in the central site of the Ackermannbogen.

Looking at Figure 3 (lower supportive function), it can be stated regarding the spatial extent of social networks with a lower supportive function is that 47 % of all 232 contacts named by the interviewees derive from the building situated in the south of the first construction phase in the Ackermannbogen. Within the remaining 53 % of contacts with persons who have a lower objective and subjective supportive function, 28 % derive from the buildings located in the north and 25 %

from those in the centre (see Figure 3). In regard towards the reach of social networks with a greater supportive function, it can be said that a total of 69 % of the regular contacts named by the interviewees (n=36) have their origin in the building located in the central part of the first construction phase of the Ackermannbogen. 14 % of the registered contacts are allocated in the housing block situated in the south and 17 % proceeded from the northern located building.

If the spatial extent of social networks with both a lower and a higher supportive function are considered by the location of the housing blocks at the northern, central and southern sites then the following can be stated (depending on the location of the buildings) (see Figure 4, 5 and 6):

Regarding the spatial extent of social networks with a lower objective and subjective supportive function from people living in social housing in the northern site (n=65), it can be stated for both men and women that nearly 90 % of the social contacts are located in the same street and/or in the same apartment block (see Figure 4). Furthermore only 5 % of all contact persons named by men and women in social housing at the northern site live in a different construction phase of the Ackermannbogen. This fact underlines the strong local connection that persons living in social housing at the northern site have with persons living likewise in social housing themselves.

The fact that the local nature of social contacts has an unequal extent, depending on the supportive function, was already shown in the more general part of this chapter (see Figure 3 and its description). For persons who live in buildings at the northern site, results show that the majority (83 %) of the potentially more stabilizing contacts which men and women have (n=6) are located in the same construction phase (see Figure 4). 17 % of the contacts with a greater supportive function live in another construction phase of the Ackermannbogen.

Regarding in comparison with the buildings sited in the north, it can be stated regarding the social contacts with

<sup>17</sup> It should be noted that deviations in the totals may result from rounding figures up or down.



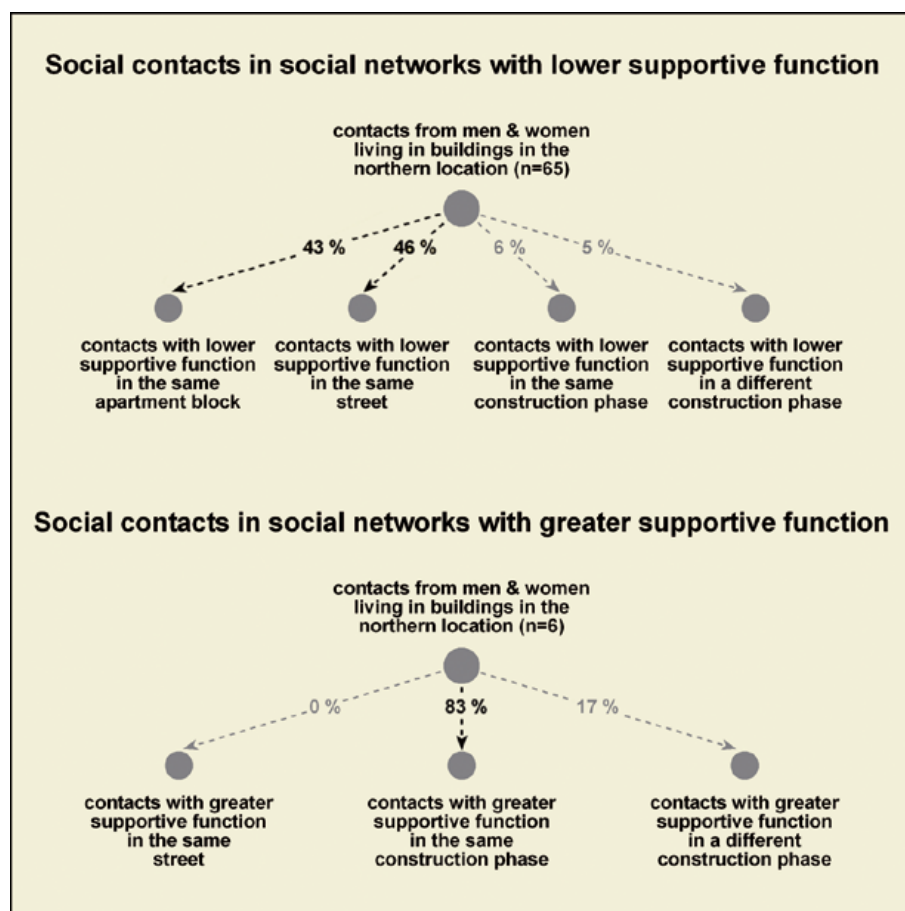


Figure 4: Social networks of men and women living in the buildings at the northern site within the first construction phase of the Ackermannbogen

Source: own computations, own figure 2017

a lower supportive function at the central location (n=58) that the local focus on the same house or on the same street as the domicile of the person questioned has decreased overall from 89 % to 72 %. At the central site – in contrast to the buildings located in the north – contacts in a different construction phase than people's own place of residence were only encountered at a low level: 2 % for men and women.

Social networks with persons with a greater supportive function (n=25) also appear to be spatially more diffuse in the case of residents at the central site than for the residents of the buildings located in the north. The men and women questioned stated that 80 % of their contact persons in non-social housing lived in the same construction phase as their own domicile. An additional 12 % of the regular contact persons living in non-social housing can be assigned to the same

street and 8 % to a different construction phase as the people surveyed.

In maintaining social networks with a lower supportive function (n=109), both men and women living in the southern housing block of the first construction phase in the Ackermannbogen appear primarily to have contacts in their own apartment blocks (50 %) or in the same street (32 %) (see Figure 6): Overall it can be assumed that men and women in social housing located in the south are separated off, socially and spatially, in their social contacts with people who have a lower supportive function<sup>18</sup>.

In apartment blocks located in the south – just as in the case of buildings

located in the north and in the centre – social networks with persons with a greater subjective and objective supportive function do not appear to be as strongly focussed spatially as is the case with networks with people in social housing. For residents in social housing located in the south it can be stated that an extremely large reach predominates here, because for both men and women all the contact persons (n=5) live in a different construction phase than the interviewees do themselves.

## Conclusion

Social networks are an important instrument for analysing their inherent social relationships between people and, according to HENNIG et al. (2012, p. 149), visualizing them is 'effective for presenting results in a comprehensible and memorable way'. The fact that social relationships can be considered to have an important role because of their inherent supportive function particularly on socially disadvantaged groups of people – at the place where people live, and thus at a local level, can be seen from their very strong social link to people's own residential environment (see HÄUSSERMANN and SIEBEL 2004, p. 114; TEXIER-AST 2017, p. 272). A central finding stemming from this study is that the location of each individual apartment exerts a perceptible influence on the number, quality and reach of social contacts in the residential environment. So firstly, for example, social contacts which are characterized by a greater supportive function proceed primarily from a housing block located centrally in the first construction phase and have a reach that is concentrated within this first construction phase but not on buildings within their own street. From this it can be concluded that in particular men and women in these apartments can benefit from the spatial proximity – generated as a result of the social mix – to persons from the middle class and from their supportive function within the same construction phase. And secondly, in the area of networks which are socially less strongly supportive, the apartments at the southern site – rather more out of the way – can be

<sup>18</sup> There are no specific statements regarding people in the age groups under 18 and 65 years of age or older due to the fact that all the people in these buildings who were prepared to take part in the standardized survey were aged between 18 and 64.

considered as the primary starting point. Their reach can be described as having a local concentration and being socially and spatially separated off as a consequence of the increased localization of contact persons in the same house or street. This result reveals that there is a great social dependence of these socially disadvantaged population groups on the residential environment. But it must be remembered that social networks – despite their special significance for socially disadvantaged population groups in the neighbourhood – do exist alongside a multitude of other social networks. In other words, social networks can exist on a city-wide, regional, national or international scale. Offering endless possibilities, the triumphant progress of the internet can also contribute to a decline in importance of social contacts in a residential environment. With these statements, it must always be remembered that these outlines of the results of the analysis of social networks in the Ackermannbogen refer primarily to people in the 18 to 64 age group. No uniform picture can be shown for men and women under 18 and 65 years of age or older pertaining to the socio-spatial distribution of their social networks in the locality – which is due to the small number of interviewees under 18 ( $n=6$ ) and 65 years of age or older ( $n=1$ ). Moreover, as shown in the previous illustrations a deviation in the size of the social networks can be stated, which leads to the derivation that the presented results of the spatial extent of the social networks cannot be described as being equal (see group mean vs. grand mean).

Another aspect which has to be borne in mind is that this study is based on a finite pool of 35 people questioned and their 268 regular social contact persons, categorized and localized. The resulting findings can therefore be designated a case study on social networks in the neighbourhood. In addition, reference should also be made to the group of people who have no regular contacts in their residential environment in the Ackermannbogen (see TEXIER-AST 2017, p. 283). For them, the Ackermannbogen appears to be the place where they live,

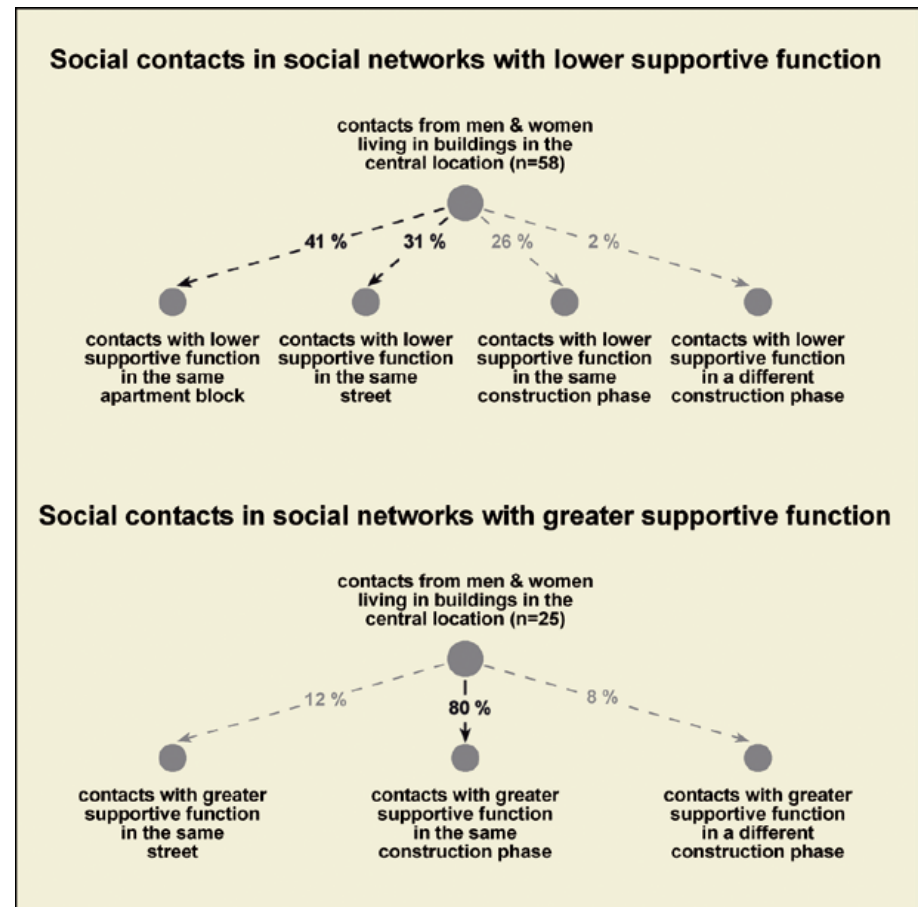


Figure 5: Social networks of men and women living in the buildings at the central site within the first construction phase of the Ackermannbogen

Source: own computations, own figure 2017

but not a place of direct social relevance for them. Consequently, the potential inherent in the supportive function – a potential produced in particular by contact with people from the middle class – cannot be fully exhausted. Furthermore the fact that more than  $\frac{3}{4}$  of all registered contacts and their relations are defined as relations towards people who have a lower supportive function underlines this fact. Therefore, the integration potential for socially disadvantaged population groups into middle class associated with the implementation of social mixing within city districts has to be defined as limited.

Another point worthy of consideration is that, although this study deals with the supportive function of social networks by creating social relations between social disadvantaged population groups and people of the middle class in one residential area,

social networks cannot be classified as being (potentially) exclusively positive.

Social networks cost 'time and energy'; they can be quite a burden and can also contribute to conflicts (see DIEWALD and LÜDICKE 2007, p. 12). Finally they can restrict personal design leeway (see *ibid.* 2007, p. 12).

Consideration must also be given to the degree of social control and social cohesion which resides in social networks. According to MAYR-KLEFF (1991, p. 278ff.) it expresses itself for both men and women in the form of slander and unwanted advice on bringing up children and is initiated by persons of the same gender.

This is a circumstance which BARTH (1998, p. 30f.), LAIREITER and LETTNER (1993, p. 15ff.) attribute to the problematic relation between the person who supports and the person who is supported. Other issues belonging to the negative

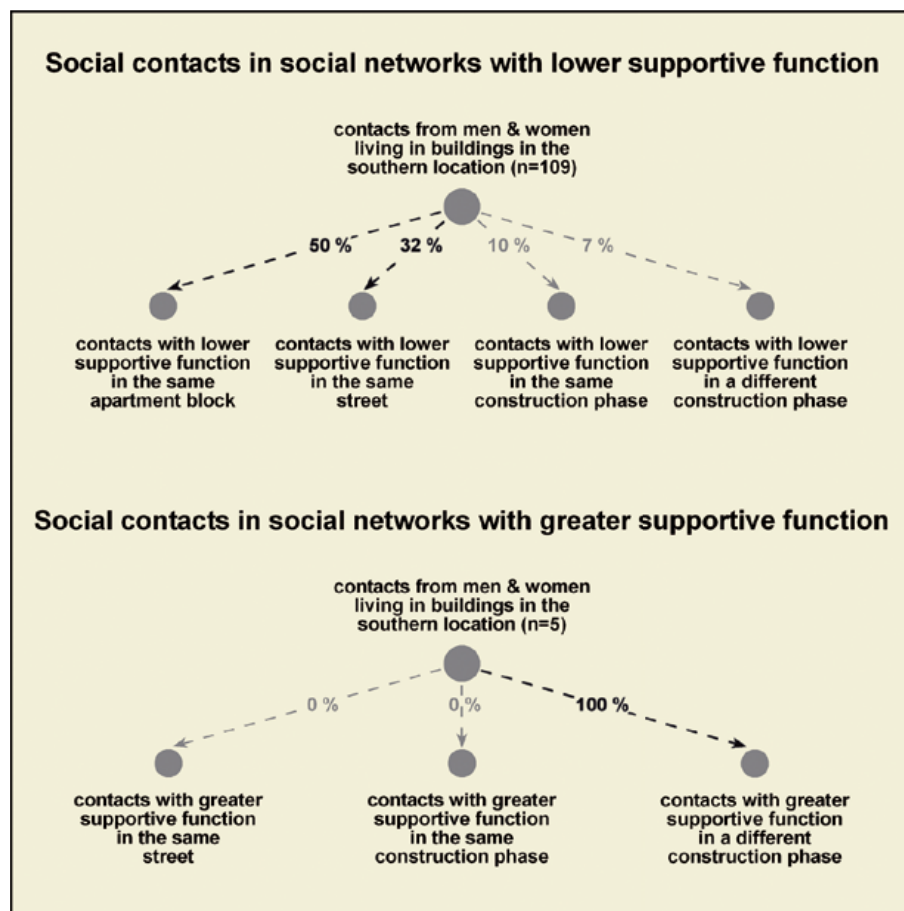


Figure 6: Social networks of men and women living in the buildings at the southern site within the first construction phase of the Ackermannbogen

Source: own computations, own figure 2017

aspects of supportive function in social networks can be:

- the feeling of being overwhelmed on the part of the supporting person interfering of the supporting person with the supported persons personal issues
- neglecting the support
- not taking problems of the supported person seriously
- or also the danger that the supported person feels ashamed or guilty (1998, p. 30f.), LAIREITER and LETTNER (1993, p. 15ff.).

Furthermore the development of social networks in the residential context does not have to occur at all respectively social relations between one person and another can also break up. This fact is based on the circumstance that the neighbourhood does not consist of people chosen voluntarily (see HÄUSSERMANN and SIEBEL 2004, p. 113). And, as already mentioned

in the theoretical part of this paper, social networks usually develop between homogenous – regarding education and age – population groups (see PETERMANN 2014, p. 50). Therefore spatial proximity does not automatically initiate social interactions and the subsequent development of social networks. In this context, and as already mentioned GRANOVETTER (1995) points out that social networks of the middle class develop and persist especially towards people of the middle or the upper class.

Finally, it should be mentioned that the inherent supportive function of social networks isn't automatically set free by creating and maintaining a social network. But they can be regarded as 'infrastructure' (DIEWALD 1991, p. 78).

Detailed research into social networks and their effects on socially disadvantaged segments of the population in a residential area offering scientific added value

can be achieved by more advanced research in the field if this includes a greater total number of interviewees and – in the best case – a more differentiated breakdown of ages. But cross-sectional studies in the field of network research can also contribute relevant findings on the effectiveness of social mixes in generating social networks in a residential area. In such a case, visualization by means of sociograms – as through the use of NodeXL in this study – makes an important contribution to showing social/spatial structures, even though it represents a necessary reduction of reality to a certain point in time, a reduction which is always shaped by the researcher, especially in the case of large amounts of basic data.

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**Резюме**

ВЕРЕНА ТЕКСИР-АСТ

**Социальные сети в жилой среде: об их теоретической концепции и визуализации с помощью программы NodeXL**

Социальные сети – им присуща поддерживающая роль не только в цифровом мире, но и в рамках реализации социального общения на местном уровне в реальном мире, что особенно актуально для лиц, находящихся в социально неблагоприятном положении, и характеризуется генерированием и поддержанием социальных контактов по месту жительства. Иллюстрация любых социальных отношений в пространстве является одновременно целью и задачей визуализации, причем в этой области появляются новые возможности для всех за счет разработки и предоставления бесплатного программного обеспечения, такого как NodeXL.

Описанный в данном исследовании пример Аккерманнбоген, городского квартала Мюнхена, столицы немецкой земли Баварии, затрагивает тему социальных сетей и их визуализации с помощью программы NodeXL, в результате чего проведенный анализ социальных сетей и визуализация демонстрируют наличие существенных различий в охвате ими аудитории. При этом они связаны с расположением своего места жительства. Мужчинам и женщинам, проживающим в центральном квартале района Аккерманнбоген, доступны социальные сети с более широкой поддержкой по отношению к проживающим в том же жилом районе. В отличие от них, социальные сети с меньшей степенью поддержки распространены преимущественно в южной части района Аккерманнбоген. Радиус этих социальных сетей социально уязвимых слоёв населения для большинства опрошенных не выходит за рамки того же жилого блока или той же улицы, на которой проживает опрошенное лицо.

*Визуализация; социальные сети; NodeXL; функция поддержки; Мюнхен; Аккерманнбоген*

**Résumé**

VERENA TEXIER-AST

**Réseaux sociaux dans l'environnement résidentiel: leur concept théorique et leur visualisation au moyen de NodeXL**

Réseaux sociaux – ils peuvent se voir investis non seulement dans le monde numérique mais aussi, de par la mise en œuvre de la mixité sociale, au niveau local dans le monde réel d'un rôle de soutien qui apparaît significatif surtout pour les personnes socialement défavorisées et qui se manifeste à travers la création et le maintien de contacts sociaux sur le lieu de domicile. Représenter ces relations sociales dans l'espace est à la fois la finalité et la fonction de la visualisation, de nouvelles possibilités s'offrant à tout un chacun dans ce domaine grâce notamment au développement et à la mise à disposition de logiciels gratuits tel que NodeXL.

L'exemple présenté dans cette étude, le quartier à caractère urbain de l'Ackermannbogen à Munich, la capitale bavaroise, reprend le thème des réseaux sociaux et de leur visualisation avec NodeXL; cela étant, l'analyse et la visualisation des réseaux sociaux réalisées révèlent de notables différences de portée desdits réseaux. Ils dépendent du lieu de résidence. Les hommes et les femmes habitant dans le centre de l'Ackermannbogen ont des rapports sociaux plus étroits avec les personnes vivant dans des logements de même génération que le leur. À l'inverse, les personnes entretenant moins de rapports sociaux vivent principalement dans le quartier sud de l'Ackermannbogen. Les rapports sociaux des groupes de population socialement défavorisés ne s'étendent, pour la majorité des personnes interrogées, pas au-delà de leur pâté de maisons ou de leur rue.

*Visualisation; réseaux sociaux, NodeXL; fonction de soutien; Munich; Ackermannbogen*